

The Digestive System

Highlight

Digestion is the process of breaking down food into molecules that can be absorbed into the body's cells.

The breaking down of food into simple substances that can be absorbed into the bloodstream is called **digestion**. Digestion takes place in the digestive system, which is made up of two types of organs. *True digestive organs* are those through which the food actually passes. *Accessory digestive organs* play a role in digestion, but the food does not pass through them. Together, all of the digestive organs make up an efficient system for breaking down food and absorbing it. Without this system, the human body would be unable to release the energy from foods that it needs to carry out life functions. The body would also not be able to use the food for growth and repair.

The Mouth

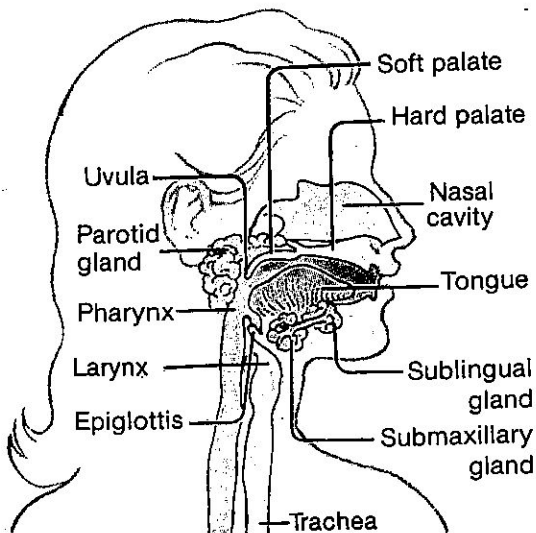
The mouth is made up of a hard, bony part and a soft, muscular section. The **hard palate** (PAL-it) is located at the front of the roof of the mouth. The hard palate separates the mouth from the nasal cavity. Along the back of the mouth, there is a section of muscle tissue, called the **soft palate**. When a person swallows, the soft palate prevents food from entering the nasal cavity. A tiny knoblike structure, called the *uvula* (YOO-vyə-lə), is suspended from the soft palate.

SALIVARY GLANDS The lining of the cheeks contain three pairs of **salivary glands**. The largest of these glands, the *parotid* (pə-RAHT-id) *glands*, are located in front of the ears. The *submaxillary* (sub-MAK-sə-ler-ē) *glands*, found beneath the tongue, open into the floor of the mouth. The third pair, the *sublingual* (sub-LING-gwəl) *glands*, are found in the front of the mouth below the tip of the tongue. They too have openings onto the floor of the mouth.

The three pairs of glands produce about 1.5 liters of *saliva* daily. Saliva is a mixture of water, **mucin** (MYOO-sin), and *ptyalin* (TĪ-ə-lin). Water makes up about 98% of saliva. Mucin is a slippery substance that lubricates food and makes it easier to swallow. Ptyalin is a digestive enzyme.

THE TONGUE Attached at the back of the mouth, the tongue takes up most of the mouth floor. It is made up of skeletal muscle covered with epithelial tissue. Scattered over the tongue are the **taste buds**, or *taste receptors*. Various types of taste buds react with different types of dissolved food. The tongue is able to detect four basic tastes, either

Figure 36-1 The salivary glands are located around the mouth. They secrete saliva, which contains enzymes that begin the chemical digestion of food.



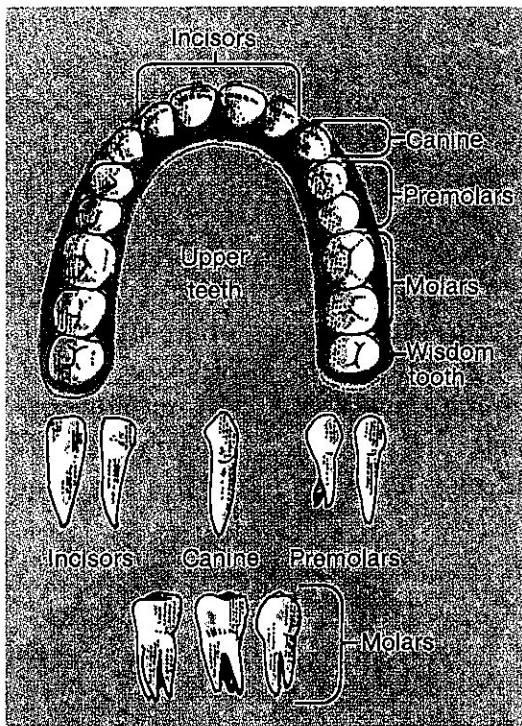


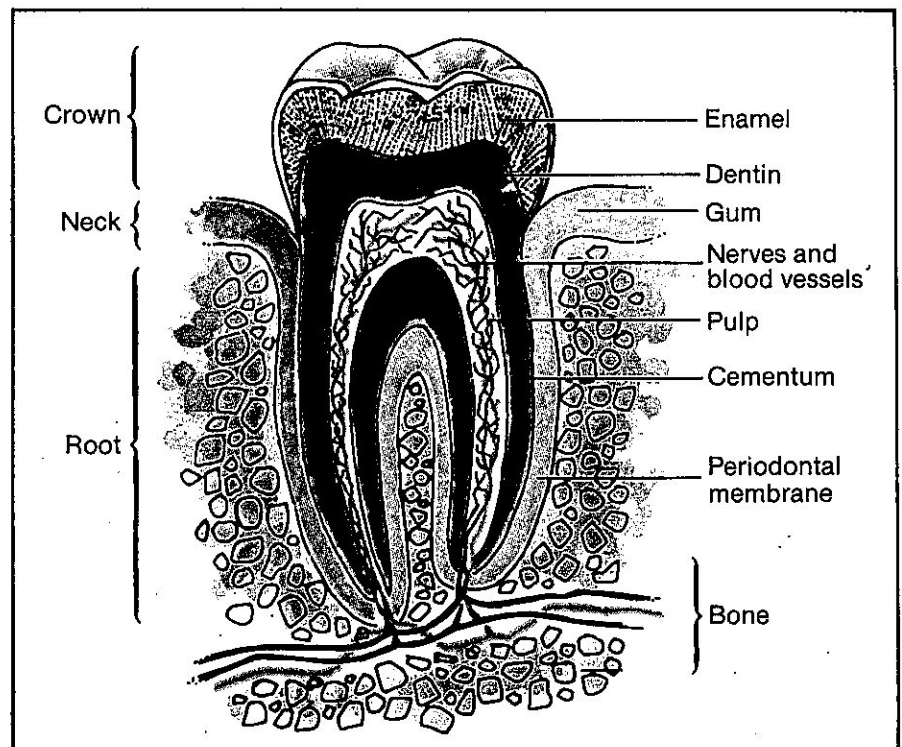
Figure 36-2 Different teeth do various jobs. Incisors and canines cut and tear food. Premolars and molars crush and grind food.

separately or in combinations. The four basic tastes are sweet, bitter, salty, and sour. In addition to tasting, the tongue aids in chewing. Either it pushes the food between the teeth or it moves the food toward the back of the mouth to be swallowed.

THE TEETH The human adult mouth contains 32 teeth, 16 in each jaw. There are, however, only 4 basic types of teeth. These basic types are the *incisors* (in-sī-zərs), the *canine teeth*, the *premolars*, and the *molars*. The four incisors are located at the center of the mouth, and they have sharp edges for cutting food. On each side of the incisors, there is a canine tooth. The canines, sometimes called the *eye-teeth*, are used to tear and shred food. There are two premolars behind each canine, followed by three molars. The third molars are called the *wisdom teeth*. Molars and premolars have flat surfaces that are used to grind and to crush food.

Each tooth is composed of the *crown*, the *root*, and the *neck*. The crown is the part of the tooth that is located above the gums. It is covered with *enamel*. Enamel is made of inorganic matter and is one of the hardest materials in the body. The root is below the gums, and it anchors the tooth in the jawbone. The root is covered with *cementum*, which holds the tooth firmly in its socket in the jaw bone. Another structure, called the *periodontal membrane*, also secures the

Figure 36-3 Structure of a Tooth



root in its socket. The area where the crown and root meet is called the neck.

Beneath the enamel and cementum, a hard substance, called *dentin*, makes up most of a tooth. A mass of dentin surrounds the *pulp*, or the innermost layer of the tooth. The pulp is made up of blood vessels, nerves, and connective tissue.

The Pharynx and Esophagus

From the mouth, food must pass through the **pharynx** (FAR-ingks) and the **esophagus** (i-SAHF-ə-gəs) on its way to the stomach. The pharynx is a muscular cavity at the back of the mouth. In addition to serving as a passageway for food and air, the pharynx aids in swallowing. The esophagus, or food tube, is a muscular tube that is 25 to 30 centimeters long and that connects the pharynx to the stomach. The main function of the esophagus is to conduct food from the mouth to the stomach. A lining on the inside of the food tube, called the *mucous* (MYOO-kəs) *membrane*, secretes *mucus*. This secretion lubricates the tube so that food can pass easily to the stomach. Between the pharynx and the esophagus is a flap of tissue, called the **epiglottis** (ep-ə-GLAHT-is). When a person swallows, the epiglottis flips down and stops food from going down the windpipe. When a person breathes, the epiglottis is in the open position.

In the esophagus, muscles contract in waves to move food from the esophagus to the stomach. These wavelike contractions, called **peristalsis** (per-ə-STAWL-sis), continue throughout the entire digestive system. Peristalsis is very strong. Even if a person ate or drank something while upside down, the food or liquid would still be moved to the stomach.

The Stomach

The esophagus is connected to the top of the stomach. The stomach is located in the *abdominal* (ə-DAH-mən'1) *cavity* beneath a sheet of muscle, called the **diaphragm** (DĪ-ə-fram). The stomach is a J-shaped, muscular pouch made up of several layers of muscle. Inside the stomach, many folds allow the organ to expand as it fills. Scattered throughout these folds are many *gastric glands*. These glands release *gastric juice*. Gastric juice is made up of enzymes, hydrochloric acid, and mucus.

The stomach empties the food into the intestine. At the intestinal end of the stomach, there is a valve called the **pyloric** (PI-LAWR-ik) valve. By opening and closing, this pyloric

Highlight

Peristalsis is the wavelike contractions that move food through the digestive system. Food moves through the mouth, pharynx, esophagus, stomach, small intestine, and large intestine. Undigested materials pass out of the anus.